

ment, and at times she was so attractive that absences without leave on the part of the dog were frequent. After one of these excursions Bully had been brought back, and chained up for the night. Next morning, while his master and I were sitting at early breakfast, it was decided that he should be released, and to effectually stop further delinquency, a peon was sent down to the bridge with orders to intercept him if he started for the cantonment.

Bully was brought in and unchained; he had that unmistakable air of detected guilt deservedly punished, and spent some time in begging for scraps from the table in a most deprecating manner. Shortly, however, he strolled into the verandah, and then down the front steps on to the gravel walk. After wandering about aimlessly for a few minutes, he quietly started off down the approach (A H B). We followed, keeping out of his sight. At the turn of the road Bully met the unexpected apparition of the peon standing on the bridge. In a moment, though not a word was spoken by the man, the dog turned and came straight back to the room, whither we had in the meantime slipped back unobserved, and re-entered it wagging his tail violently and looking exceedingly sheepish. He now lay down and closed his eyes. The cocked ears showed that sleep was mere pretence, and he soon rose again, went out into the front garden, and hunted for buried bones, purely imaginary ones, I believe. His search gradually led him down the hill by the foot-path (a),—we keeping him in sight, as before—and he finally reached the road at the bottom. There all disguise was dropped, and he started off for the cantonment. As he neared the spot (F) the peon espied him, and shouted out his name. He turned at once, climbed the hill, and came into the bungalow, where the same face of repentance was gone through.

Bully now seemed to have made up his mind that escape was impossible; he lay down on a mat in the verandah, and remained there for a long time. But for the persistent cock of the ears we should have imagined the animal really asleep. Mr. Cherry eventually went to his office-room, and I remained in the verandah reading the morning paper, and occasionally glancing at Bully. He lay very still, but once or twice I detected him opening his eyes and raising his head to look round him. Each time he caught my eye he wagged his tail vehemently for a moment or two, and then resorted to his sham sleep.

It may have been for half-an-hour, or thereabouts, that this state of things continued. I then became interested in an article in the paper, and when I next looked up Bully was gone. I called Mr. Cherry, and the house was searched. No Bully. The peon was sent for and interrogated; he had not seen the dog. As a last resource inquiry was made of the horsekeepers down at the stables (D). The reply was—"Yes, the dog had passed through the gate (D) some time before." Taking advantage of my occupation and the absence of his master, Bully had left the house, and taken his way to the cantonment by the only path by which he could have escaped unnoticed by the peon—that shown by the dotted line.

In this necessarily short account I have hardly done justice to Bully's diplomatic powers, but most of your readers will appreciate the intelligence that led the dog to successfully elude the watch set over him.

E. H. PRINGLE

A SMALL English terrier belonging to a friend has been taught to ring for the servant. To test if the dog knew *why* it rang the bell he was told to do so whilst the girl was in the room.

The little fellow looked up in the most intelligent manner at the person giving the order (his master or mistress, I forget which), then at the servant, and refused to obey, although the order was repeated more than once.

The servant left the room, and a few minutes afterwards the dog rang the bell immediately on being told to do so.

Royal Institution, March 14

JOHN RAE

OBSERVING the remarks of Mr. G. Henslow (NATURE, vol. xix. p. 433) in reference to "abstract reasoning" as not to be observed in the lower animals, it has occurred to me that the following facts may have a useful bearing on this subject:—My sister, who lives just opposite to my own house, possesses a cat (now about thirteen years old) whose intelligence is very remarkable. He has the habit of making use of the knocker of a side door, which is just within his reach as he stands on his hind legs, whenever he desires admission. A single knock is tried in the

first instance, but if this is not answered promptly it is followed by what is known as a "postman's knock;" if this is not successful, trial is then made of a scientific "rat-tat" that would not disgrace a west-end footman. I should say that "Minnie" holds the knocker in his paw as we should hold it in our fingers, and not by simply tipping it up. How far this practice involves "abstract reasoning" I will not say, but something like an approach to it is suggested, for he was never taught to knock at the door, and adopted the habit some three years ago, evidently to gain admittance, very often to the annoyance of my sister's family, who have occasionally been disturbed in this way at unseemly hours. I should be sorry in thus referring to the sagacity of poor pussy (who is now also somewhat feeble) to reflect upon him by noticing some other of his peculiarities, one of which is his fondness for a little brandy and water and other alcoholic stimulants; but I think what I have referred to may be interesting to Mr. Henslow or some other of your correspondents, and it is within my own knowledge and observation. G. M.

March 15

MR. HENSLAW asks for "cases of purely abstract mental reflection in animals," and in reply I mention a case in Somersetshire of a kitten about half grown, at a house where I was stopping, having mental reflection of some sort.

I was sitting in one of the rooms, the first evening there, and hearing a loud knock at the front door, was told not to heed it, as it was only this kitten asking admittance. Not believing it, I watched for myself, and very soon saw this kitten jump on to the door, hang on by one leg, and put the other fore-paw right through the knocker and rap twice.

The knocker was an ordinary-shaped one fixed in the centre of the door, half way up; the top part of the door was glazed. I saw this performance dozens of times afterwards, and often used to put the kitten outside to see it done. It was never known to knock when any one stood in the garden, but if one went in-doors and shut it outside, in a few minutes came the usual knock.

A sister kitten to this one was never known to knock, but sat on the doorstep and entered when the door was opened, and in nine cases out of ten the knocks were successful.

This kitten was never taught in any way; it would knock at both front and back doors. I should like to know if Mr. Henslow considers this practical or abstract reflection; the result was *practical*.

MAURICE BELSHAM

Simla Cottage, Barnes

THE explanations by Mr. Nicols (NATURE, vol. xix. p. 433) fail to convince me that the rats cut the pipes to get at the water. I have seen the edge of joists cut or gnawed about eight inches above the ground, where the rat would have to stand on its hind legs to do it—What was that for? Again, why does our cat scratch the legs of the kitchen table? It seems to me that rats are often like children, they must be doing something to work off the energy within them, and fill up the time, and they often do things without any definite reason. Lastly, if the water is at high pressure especially do they stop to drink the water at all? It also runs in my mind that the rats cut the lead pipes where there was plenty of clean water without doing so.

Glasgow, March 17

W. P. BUCHAN

I BEG to thank Mr. Nicols for his courtesy in supplying the missing links of evidence in the rat cases (NATURE, vol. xix. p. 433), cases which may, I think, be applied with reference to Mr. Henslow's difficulty concerning "abstract mental reflection;" for it seems to me now that the most probable supposition is that the rat-community had learned through experience (likely got accidentally in cutting pipes which obstructed their operations) that such-like pipes at times contain water, and by exercise of reason came to the conclusion that it was worth while to make the exploration in the instances given.

I give the following as told me by my wife—now dead—who personally witnessed the transaction on various occasions:—At her sister's house in Kent a donkey which, when not employed by the children, grazed in a field with some cows, was in the regular habit of acting as follows:—At the usual hour for the cows to come home to be milked the donkey lifted the latch of the field gate, opened and held back the gate (which would otherwise have swung close again) till all the cows passed out, then allowed the gate to shut, and went home with the cows. Of

course no one taught the donkey to do this; but the quadruped gave the biped a practical lesson, from which I am not aware that they drew the abstract verbally formulated conclusion that reason may be exercised without rhetoric.

March 14

HENRY MUIRHEAD

I BELIEVE that instances of rats gnawing through water-pipes are frequent. Two have come to my knowledge during the past fortnight. The one instance occurred at the house of a gentleman near West Hartlepool; in the other case a large hole, $3\frac{1}{2}$ inches long, and varying from $\frac{1}{8}$ ths of an inch to $\frac{1}{4}$ th inch in breadth, was gnawed in the fresh-water pipe of the screw-steamer *Mary Cove*dale. A portion of this pipe, containing the hole, was cut off, and is preserved by me; it is a stout leaden pipe, a quarter of an inch thick, and with a diameter of $2\frac{3}{4}$ inches. It is very doubtful whether there was any flaw before the hole was begun.

R. MORTON MIDDLETON

West Hartlepool

Distribution of the Black Rat

PERHAPS some of the readers of NATURE may be able to throw some light on the present geographical range of the Black Rat (*Mus rattus*, L.). In the early part of 1877 some individuals of this species came on board the steamship *Lady Frances* either at Bombay or at Rangoon, but, as the captain believes, at the latter port. The animals multiplied on board the vessel, and in August last I had the pleasure of receiving from the ship a living specimen, which was at once forwarded to the Zoological Gardens in Regent's Park, where, I believe, it may still be seen. In a "Catalogue of the Mammals of the Sahara," by my friend, Canon Tristram, F.R.S. (vide "The Great Sahara," p. 385), the author states that the "Far el Kila," as the black rat is called by the Arabs, "still maintains its position" in the Algerian Sahara. And I was yesterday presented by Mr. F. Donald Thompson, of Seaton-Carew, with a skin of *Mus rattus* from New Zealand. This example, like those from Bunnah, was brought over by a vessel (the *Tweedyan*) which loaded grain at Lyttelton, in the province of Canterbury, New Zealand, where the rats embarked. In August, 1878, Dr. Selater, F.R.S., was good enough to inform me that "*Mus rattus* has rather an extensive range over Europe and Western Asia," and added, "I fear it would not be possible to state it very exactly." But it is evident that the range of the species is much wider, as it is known to occur in North Africa, British India, and New Zealand; and it is also said, by Prof. Bell and Mr. Macgillivray, to have been carried to America and the South Sea Islands by ships. I should be glad to have further evidence as to its occurrence in Bunnah, and it would be also desirable to know if it is found in the Malay Archipelago, China, Japan, or Australia. Dr. Peters, of the Zoological Museum at Berlin, assured me, in June last, that the species was extremely rare, if not actually extinct, in Germany, and showed me the only specimen in the fine collection under his care—an old and faded skin from Hanover. The animal lingers in one old building at Stockton-on-Tees, and there is clearly a possibility of its being reintroduced in many seaport towns through the agency of ships.

West Hartlepool, March 11

R. MORTON MIDDLETON

The United States Fisheries

IN your review of the report of the United States Commission of Fish and Fisheries, you say you are of opinion there is almost no difference between *Salmo salar* and *Salmo gairdneri*. My friend Prof. Baird sent me his report some time since, and also forwarded several thousand eggs of *Salmo gairdneri* for experiment in the hatching tanks of the Southport Aquarium. The eggs hatched out remarkably well, a very small percentage only being lost, and have proved much more hardy and tenacious of life than any *Salmo salar* I ever had to do with, and very much easier to feed. *Salmo salar* have never done well except when fed on the minute red worms found on the mud in the beds of some rivers and streams (our supply was obtained from the Thames). *Salmo gairdneri*, however, live well, and grow faster on the roe of fish (refuse from the fish market), such as whiting, than *S. salar* will on anything. From what I have seen of them I quite agree with Prof. Baird in his admiration of this member of the salmon family, and I share his surprise that it has attracted so little attention among English fish-culturists. It would certainly be a most valuable addition to our food-fishes,

stronger, and apparently of more rapid growth than our native species. On the continent, and in New Zealand and other countries, it is most greedily sought after, and each season for several years past an agent has carried from America to France, Germany, and other countries, large consignments of the ova. In England, so far, it appears to have been quite neglected.

Hill Fold, Bolton, March 15

CHAS. L. JACKSON

Plovers in the Sandwich Islands

I CAN vouch for the truth of the visit of golden plovers to the Sandwich Islands mentioned by Prof. A. Newton in NATURE, vol. xix. p. 433. They are very numerous during the winter from November until March. I do not know the scientific name, but I have shot a great many on Oahu and Hawaii.

If it will help Mr. Newton in the solution of the very interesting question he raises I may mention that M. Baillière, Consul-General for France at Honolulu, is in the habit of sending specimens of birds to (I think) the Jardin des Plantes, Paris, where doubtless a specimen might be found.

Hertford, March 15

S. LONG.

Unscientific Art

IN the *Graphic* for December 28 there appeared a sketch of a man taking a reading on a marine barometer, on board the *Sarmatian*, during the voyage of the Marquis of Lorne to Canada. To see the scale better by the light of his lantern, the observer is represented as sloping the barometer at an angle of about 30° from the vertical.

New Kingswood, Bath

JOHN W. BUCK

ON THE POSSIBILITY OF EXPLAINING THE CONTINUANCE OF LIFE IN THE UNIVERSE CONSISTENT WITH THE TENDENCY TO TEMPERATURE-EQUILIBRIUM

THE idea of the ultimate final cessation of all physical change and life in the universe¹ has been contemplated by many physicists with some dissatisfaction, and with the desire if possible to find some explanation or physical means by which so apparently purposeless an end is averted, and of avoiding the necessity for assuming in past time a violation of physical principles at present recognised to exist.² Several attempts have been made to surmount the difficulty,³ but apparently with no generally satisfactory result. Having given much time to physical problems having a relation more or less to this question, and having always kept the question itself in view, I should like to submit the following conclusion to the readers of NATURE as an attempt to solve the difficulty, though what I have to bring forward is probably not entirely new, as considerations partially tending towards the same final result have already been published by Mr. James Croll, *Phil. Mag.*, May, 1868, "On Geological Time;"⁴ and Mr. Johnstone Stoney, "On the Physical Constitution of the Sun and Stars," *Proc. of the Royal Society*, 1868-69. The groundwork of what I have to suggest may be described in a few words.⁵

Taking a general view of the universe, we may consider it as so much matter, which contains a certain quantity of energy. Let us suppose for illustration the energy of

¹ Thomson, "On the Universal Tendency in Nature to the Dissipation of Mechanical Energy," *Phil. Mag.*, October, 1852; Clausius, Ninth Memoir, *Pogg. Ann.*, July, 1865; see also Tait, "Recent Advances in Physical Science," second edition, p. 22.

² The allied idea of the whole universe tending to agglomerate into one mass under the action of gravity, the notion of instability thus involved, all this has something incongruous and unnatural about it that appears to be scarcely in harmony with the orderly working of physical phenomena, and would seem to point to the necessity for some additional explanation.

³ Grove, "Corr. of Physical Forces," p. 67; Rankine, "On the Reconciliation of the Mechanical Energy of the Universe," *Phil. Mag.*, November, 1852, &c., &c.

⁴ Also *Quarterly Journal of Science*, July, 1877.

⁵ The same problem was considered by the writer in special reference to I.e. Sage's theory of gravitation in the *Quarterly Journal of Science* for July last, but my present object is to deal with the question entirely independently of any special theories, and solely on the basis of generally accepted facts, or facts which if not known would be in harmony with or deducible from those which are known.